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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/606,252 06/28/00 MADURAWA R A293D

026059 MM91/0821
TOWNSEND AND TOWNSEND AND CREW LLP/ 0151
TWO EMBARCADERO CENTER
8TH FLOOR
SAN FRANCISCO CA 94111-3834

EXAMINER

BROCK II, P

ART UNIT PAPER NUMBER

2815

DATE MAILED: 08/21/01

PI as find below and/or attached an Office communication concerning this application or
pr ceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/606,252

Examiner

Paul E Brock II

Applicant(s)

MADURAWA ET AL.

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 June 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

Application/Control Number: 09/606,252
Art Unit: 2815

DETAILED ACTION

Drawings

1. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

2.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 21 – 26 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. It is not clear how a single mask can be used to accomplish depositing a field implant, depositing a well implant and depositing an enhancement implant.

Further, it has been stated on page 10, lines 6 – 10 of the originally filed application “Using a single p-well mask, by varying the energy levels and dopants, any of the three elements are formed.” One of ordinary skill in the art would have no basis of knowing what energy level or what type of dopants could or should be used for performing any of the three implants as disclosed and claimed by the applicant. It would require unnecessary experimentation to simple begin to understand the use of a single mask in implanting these three impurity regions. For example, while it is understood that the figures are only a representation of the invention, how

Application/Control Number: 09/606,252

Art Unit: 2815

does one mask so clearly define a field implant that extends beyond the boundaries of a p-well? Even with the explanation that different energies are used there seems to be no way to create such a continuous and consistent field implant under an isolation region where a p-well apparently has a boundary before the field implant ends. It would at first appear that this boundary is formed by the mask that the applicant claims, however, if this is so, the field implant would have the same boundary.

5. Claims 38 – 40 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. It is not clear where in the originally filed specification support for the last line in the claim “wherein the concentration of pocket implant under the gate is non-uniform” can be found.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. The term “approximately” in claim 27 is a relative term which renders the claim indefinite. The term “approximately” is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is not clear how much contact of the first and second pocket implant is defined by the term “approximately”. Does approximately

Application/Control Number: 09/606,252

Art Unit: 2815

mean that the first and second pocket regions are near each other, separated by a small distance, or does it mean that they are overlapping with each other.

8. Claims 38 – 40 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With regard to claim 38 specifically, there appears to be a typo in the last line of the claim “wherein the concentration of pocket implant under the gate is non-uniform.” It could read as “wherein the concentration of the pocket implants under the gate is non-uniform” or “wherein the concentration of pocket implants under the gate is non-uniform” or “wherein the concentration of a pocket implant under the gate is non-uniform” or “wherein the concentration of the pocket implant under the gate is non-uniform”. In any case it is not clear what the applicant is claiming and in the case of the last option, there is no antecedent basis for “the pocket implant”.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Art Unit: 2815

10. Claims 27 – 31, 33 – 36 and 38 – 40 are rejected under 35 U.S.C. 102(e) as being anticipated by Kao et al.

With regard to claim 27, Kao et al. discloses in figure 2a – 2g a method of fabricating a transistor in an integrated circuit device. Kao discloses providing a semiconductor substrate (204), forming a gate oxide (206) on the semiconductor substrate and forming a gate (210) on the gate oxide in figure 2a. Kao discloses in figure 2c implanting a first pocket implant (222 and 214) into the semiconductor substrate from a first side of the gate. Kao discloses in figure 2c implanting a second pocket implant (222 and 216) into the semiconductor substrate from a second side of the gate. Kao discloses in figures 2c – 2g that the first pocket implant is approximately in contact with the second pocket implant.

With regard to claim 28, it is inherent that Kao discloses diffusing the first pocket implant and the second pocket implant laterally in the semiconductor substrate.

With regard to claim 29, Kao et al. discloses in column 4, lines 53 – 56 the first pocket implant and the second pocket implant are implanted at an angle.

With regard to claim 30, Kao et al. discloses in column 4, lines 45 – 49 the first pocket implant and the second pocket implant are implanted using the gate as a mask.

With regard to claim 31, it is inherent in the method of Kao et al. that the diffusing increases a reverse short channel effect of the transistor.

With regard to claim 33, Kao et al. discloses in column 5, lines 13 – 32 forming a source on the first side of the gate and a drain on the second side of the gate, wherein the source and drain are doped at a first polarity and the first pocket implant and the second pocket implant are doped at a second polarity.

Art Unit: 2815

With regard to claim 34, Kao et al. discloses in column 5, lines 13 – 32 that the first polarity is different than the second polarity.

With regard to claim 35, Kao et al. discloses in figure 2a – 2g a method of fabricating a transistor in an integrated circuit device. Kao discloses providing a semiconductor substrate (204), forming a gate oxide (206) on the semiconductor substrate and forming a gate (210) on the gate oxide in figure 2a. Kao discloses in figure 2c implanting a first pocket implant (222 and 214) and a second pocket implant (222 and 216) into the semiconductor substrate using the gate as a mask. It is inherent that Kao et al. discloses diffusing the first pocket implant and the second pocket implant laterally and at an implant angle of 60 degrees as disclosed in column 4, lines 60 – 63 the first pocket implant would inherently merge with the second pocket implant. This merging of the first pocket implant and second pocket implant is depicted in figures 4a and 4b.

With regard to claims 36, Kao et al. inherently discloses that the diffusing increases a reverse short channel effect of the transistor.

With regard to claim 38, Kao et al. discloses in figures 2a – 4b providing a semiconductor substrate. Kao et al. discloses in figures 2a – 4b forming a gate oxide on the semiconductor substrate. Kao et al. discloses in figures 2a – 4b forming a gate on the gate oxide. Kao et al. discloses in figures 2a – 4b, column 4 lines 53 – 67, and column 5, lines 1 – 3 and 33 – 50 implanting a first pocket implant into the semiconductor substrate from a first side of the gate at an angle. Kao et al. discloses in figures 2a – 4b, column 4 lines 53 – 67, and column 5, lines 1 – 3 and 33 – 50 implanting a second pocket implant into the semiconductor substrate from a

second side of the gate at an angle. It is inherent in the method of Kao et al. that the concentration of pocket implant under the gate is nonuniform.

With regard to claim 39, it is inherent in the method of Kao et al. diffusing the first pocket implant and the second pocket implant laterally in the semiconductor substrate.

With regard to claim 40, Kao et al. discloses in figures 2a – 4b, column 4 lines 53 – 67, and column 5, lines 1 – 3 and 33 – 50 wherein the first pocket implant and the second pocket implant are implanted using the gate as a mask.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 32 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kao et al. as applied to claims 27 and 35 above, and further in view of Gilgen et al.

Kao et al. does not disclose implanting an enhancement implant. Gilgen et al. teaches in figure 8 and column 6, lines 56 – 62 implanting an enhancement implant in the semiconductor substrate. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the enhancement implant of Gilgen et al. in the method of Kao et al. in order to adjust the threshold voltage of a device as stated by Gilgen et al. in column 6, lines 56 – 62.

13. Claims 21 – 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilgen et al. in view of Stolmeijer et al.

Art Unit: 2815

Gilgen et al. discloses in figures 1 and 6 – 8 a method of fabricating an integrated circuit. In figures 7 and 8 Gilgen et al. discloses depositing a field implant (62). In figure 1 Gilgen et al. discloses depositing a well implant (15). In figure 8 Gilgen et al. discloses depositing an enhancement implant. Gilgen et al. does not disclose depositing a field implant, depositing a well implant, and depositing an enhancement implant using a single mask. Stolmeijer et al. teaches in figure 1 using a single mask to do three separate implants. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the single mask of Stolmeijer et al. in order to complete the three implants of Gilgen et al. in order to realize n-wells and p-wells by means of only a single implantation mask as stated by Stolmeijer et al. in column 2, lines 36 – 39.

With regard to claim 22, Gilgen et al. discloses in figure 4 that the well implant is an n-well.

With regard to claim 23, Gilgen et al. does not disclose the well implant as an n-well. It is well known in the art to use the same process to form an n-well or a p-well by simply changing the dopant. The process is the same while the result is different. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use a p-well implant instead of an n-well implant in order to create an n-channel gate instead of a p-channel gate.

14. Claim 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Gilgen et al. in view of Stolmeijer et al. as applied to claim 21 above, and further in view of Icel et al.

Gilgen et al. in view of Stolmeijer et al. does not disclose forming a high voltage native transistor. Icel et al. teaches in figure 3 forming a high voltage native transistor (45) by blocking

a well implant (13) and an enhancement implant, as stated in column 7, lines 25 and 26, and offsetting the field implant (48) from an active area of the native transistor, thereby obtaining high gated-diode junction breakdown characteristics. It would have been obvious to one of ordinary skill in the art at the time of the present invention to use the formation of a native transistor of Icel et al. in the method of Gilgen et al. in view of Stolmeijer et al. in order to have a native transistor with threshold voltage around 0 volts as stated by Icel et al. in column 7, lines 26 and 27.

15. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilgen et al. in view of Stolmeijer et al. as applied to claim 21 above, and further in view of Kao et al.

Gilgen et al. in view of Stolmeijer et al. does not disclose implanting a pocket or depositing two pocket implants. Kao et al. teaches in figures 4a and 4b, and columns 6 and 7, lines 43 – 67 and 1 – 9 the use of pocket implants. In figure 4a Kao et al. teaches implanting a pocket implant (460) to improve a punch-through immunity. In figure 4b depositing two pocket implants and merging the pocket implants together (460). It is inherent that the pocket implants of Kao et al. are merged together by lateral diffusion, whereby a channel doping profile from the pocket implant diffusion exhibits reverse-short-channel effect. It would have been obvious at the time of the present invention to use the pocket implant method of Kao et al. in the method of Gilgen et al. in view of Stolmeijer et al. in order to avoid short channel effects as stated by Kao et al. in column 7, lines 16 – 18.

Response to Arguments

16. Applicant's arguments filed 6-28-2000 have been fully considered but they are not persuasive.

With regard to claims 21 – 26, the arguments drawn toward the §112 first paragraph rejection, it has been stated on page 10, lines 6 – 10 of the originally filed application “Using a single p-well mask, by varying the energy levels and dopants, any of the three elements are formed.” One of ordinary skill in the art would have no basis of knowing what energy level or what type of dopants could or should be used for performing any of the three implants as disclosed and claimed by the applicant. It would require unnecessary experimentation to simply begin to understand the use of a single mask in implanting these three impurity regions. For example in regard to figures 1a and 1b, while it is understood that the figures are only a representation of the invention, how does one mask so clearly define a field implant that extends beyond the boundaries of a p-well? Even with the explanation that different energy levels are used there seems to be no way to create such a continuous and consistent field implant under an isolation region where a well apparently has a boundary before the field implant ends. It would at first appear that the well boundary is formed by the mask that the applicant claims, however, if this is so, the field implant would have the same boundary. The applicant uses figures 2a and 2b to defend his argument, and it would be noted that in these figures the field implant and the p-well boundary are the same, but these figures don't even show the enhancement region (130). Finally, the applicant has explained that it is possible to make these three implants using a single mask but fails to disclose a position of a mask during any of the three implants.

With regard to claims 21 – 26, the arguments drawn toward the §103(a) rejection, the applicant argues that “Stolmeijer et al. in figure 1 shows the use of mask 8 for two implants.” A review of figure 1 of Stolmeijer et al. clearly shows three implants (10, 11 and 14) defined by a single mask (8), and further in column 7, lines 44 – 50 of Stolmeijer et al. the third implant (14) is clearly implanted while the mask (8) is still in place.

With regard to claims 27 and 35, the applicant argues that in Kao et al. “The channel edges of the implant areas are shown to be coincident with the source and drain regions.” It is known that the figures are only representations of the disclosed invention. The embodiment that Kao et al. discloses in figures 2a – 2g is one embodiment described in column 4, lines 43 – 53 which implants the ions for both the pocket implant and the source and drain implants at a 90 degree angle only using the gate as a mask. Kao et al., however, makes it clear that the pocket implants do not need to be aligned to the sides of the gate and can be implanted at an angle as disclosed in column 4 lines 53 – 67, and column 5, lines 1 – 3 and 33 – 50, and therefore the source and drain implants are not always aligned with the pocket implants. Thus, because the source and drain are not ever implanted at an angle, the source and drain would never diffuse into each other and render the device inactive as is suggested by the applicant.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Okumura et al. disclose many ways of forming well, enhancement, and field implants. Hu et al. teach the diffusion of species in pocket regions.

Art Unit: 2815

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paul E Brock II whose telephone number is (703)308-6236. The examiner can normally be reached on 8:30 AM-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703)308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

Paul E Brock II
August 16, 2001



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800